

**MIDDLE MOUNTAINS TRAINING OF HIGH-QUALIFIED VISUALLY
IMPAIRED SPINTERS**

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Purpose: determine the impact of middle mountains training on the visual acuity and the level of preparadness of highly qualified visually impaired sprinters.

Material and methods: we studied the indicators of the level of preparadness and visual acuity of the Honored Master of Sports of Ukraine in para-athletics among athletes with visual impairments in the middle mountains. The following methods were used: analysis and generalization of scientific and methodological literature, analysis of training loads and processing of parameters of training activity, pedagogical observation, pedagogical experiment (auto experiment), visometry, methods of mathematical statistics.

Results: middle mountains training led to positive changes in the indicators of the functional state of the visual analyzer and the level of preparadness of athlete.

Conclusions: the use of preparation of highly qualified visually impaired sprinter in middle mountains training positively influenced the development of the level of special preparadness and the visual acuity.

Keywords: middle mountains, special preparadness, visual acuity, visually impaired.

Introduction

Training in mid-mountain conditions has long been an effective means of preparing qualified athletes for high-level competitions [8, 11].

It is generally accepted that in mid-mountain conditions there are a number of factors that cause hypoxia in the human body. The main ones are: atmospheric pressure density, reduction of atmospheric and partial pressure [2, 4]. Most scientists believe that it is hypoxia that is one of the factors of successful preparation for competitions and an effective means of mobilizing the body's functional reserves and transferring it to a new, higher level of adaptation for competitions in plain conditions [6, 8, 9, 11]. J. Kolba believes that training in the mountains contributes to the economy of work, which is expressed in an increase in the oxygen capacity of the blood and oxygen diffusion into muscle tissue [3]. V. N. Tutevich, D. B. Dill, L. G. C. E. Pugh in their works note that when moving in cyclic sports in a rarefied atmosphere, it is possible to develop higher speeds, especially its individual components: the frequency of movements and the speed of a single muscle contraction [17]. The impact of hypoxia caused by a decrease in the partial pressure of oxygen in the inhaled air and hypoxia arising under the influence of high-intensity loads on the preparedness of athletes are devoted to the work of A. S. Kolchinskaya, V. M. Platonov, M. M. Bulatova [2, 4]. In the works of J. Vigil, F.P. Suslov, E.B Gippenreiter, T.V. Samolenko and V.M. Platonov, exemplary models of mesocycles of training of highly qualified athletes in the middle and high mountains during the preparation for the main competitions are given [6, 8, 9, 10, 13, 14]. According to Ya. M. Kots [6], an increase in the sensitivity of sensory apparatuses under the influence of a complex of climatic factors in the middle mountains leads to a decrease in the speed of a motor reaction: latent time, contraction and relaxation of muscles. V. M. Platonov points out that training in mid-mountain conditions, along with improving the capabilities of various parts of the energy supply system, can negatively affect the most important components of technical and tactical skill, as well as a number of important components of physical and mental fitness [9]. At the same time, A. S. Kolchinskaya in her research found that training in mid-mountain

conditions using traditional means and methods significantly improves the endurance and speed-strength qualities of runners than the use of the same means in plain conditions [4].

In the scientific and scientific-methodical literature, the use of training in mid-altitude conditions in many sports, especially those related to the manifestation of endurance, is widely described. Much less work is devoted to the training of athletes in mountain conditions, in whose sports activity endurance is not a determining factor (strength, speed-strength, complex coordination, martial arts). The use of training in mid-mountain conditions in the training of Paralympic athletes with visual impairments today has no scientific justification. There is also no information about the influence of loads in mid-mountain conditions on the functional state of the visual analyzer. Coaches of the National Paralympic Team of Ukraine use "mountain" training in the preparation of athletes, relying on their own experience and the experience of training athletes who do not have health problems. Therefore, the study and elucidation of the influence of training in mid-altitude conditions on visual acuity and the level of special preparedness of highly qualified sprinters with visual impairments are relevant.

Purpose of the study is to determine the effect of training in mid-altitude conditions on visual acuity and the level of special preparedness of highly qualified athletes with visual impairments, specializing in sprinting.

The study was conducted on the topic "Features of the temporal-spatial characteristics of sports (athletics) and everyday motor activity" for 2020-2021 (state registration number 0119U103785).

Material and Methods of research

The study was conducted in July-August 2021 during the preparation of athletes for the XVI Paralympic Games, which were held in Tokyo (Japan). The Honored Master of Sports of Ukraine in athletics among athletes with visual impairments, Paralympic champion, world record holder took part in the study. The study was conducted in the city of Kayseri (Turkey) in mid-mountain conditions and

complied with bioethical standards. The sportswoman in the national Paralympic athletics team of Ukraine lived at an altitude of 1059 m above sea level.

During testing, the athlete performed each exercise three times. All results were consistent with model performance for visually impaired sprinters. The athlete participating in the study was 27 years old and had a congenital damage to the visual apparatus: partial atrophy of the optic nerve in both eyes. The percentage of damage to the left eye is higher than the right. The visual acuity of the studied athlete was determined by the doctor of the national Paralympic athletics team of Ukraine according to the Sivtsev table. Since the athlete's vision did not allow seeing the symbols of the table from 5 m, Snellen's formula was used for accounting:

$$VISUS = d/D,$$

where V - visual,

d - distance from which the athlete saw the symbol of the table,

D - tabular value indicated on the left in the Sivtsev table.

Visometry was carried out during each test three times, the athlete's rest between measurements was 10-12 minutes in a sitting position with her eyes closed. According to the international classification, the visual acuity indicators of the athlete corresponded to the T13 class.

The following methods were used in the study: analysis and generalization of scientific and methodological literature, analysis of documentary materials (diaries and training plans), pedagogical observation, pedagogical experiment (auto experiment), visometry, methods of mathematical statistics.

Statistical analysis of the obtained data was carried out on a personal computer using Statgraphics Centurion 18 (version 18.1.11), using a t-test for the significance of differences in the means of related (dependent) samples.

Results of the research

The great practical experience of scientists and trainers allows us to assert that training in mid-altitude conditions is quite effective for athletes specializing in various sports, including those requiring the manifestation of speed-strength abilities [13, 15, 16, 19] . In order to prepare for the culminating competitions of the year, a

training plan was drawn up and the initial indicators of visual acuity and the level of preparedness of the athlete participating in the study were determined (Tables 1-2).

Table 1

Indicators of the level of preparedness of an female athlete at the beginning of the study (n=1)

Indicators	Result	
	\bar{X}	σ
Standing long jump (m)	2,60	0,03
Triple Jump (m)	7,31	0,03
Running 10 m low start on command (s)	1,62	0,03
Running 30m(s)	4,01	0,04
Running 100m (s)	12,65	0,05
Running 150m(s)	19,78	0,03

Testing data at the beginning of the study were consistent with model characteristics for visually impaired highly skilled sprinters.

The visual acuity of the left eye at the beginning of the study is lower than the right one. According to the international classification, the indicators of visual acuity of the studied athlete corresponded to the T13 class.

Table 2

Visual acuity scores at the beginning of the study (n=1)

Visual acuity (V)	Result	
	\bar{X}	σ
Right eye	0,063	0,003
left eye	0,065	0,001

In the first 3 days of the training camp, the training sessions were aimed at adapting the athlete to physical activity in mid-altitude conditions. The athlete trained 2 times a day. Morning workouts consisted of a warm-up, special exercises to develop running technique, attention exercises, a run of 4-5 segments and a hitch. Evening workouts were mostly power in nature. When performing physical activity, the athlete experienced shortness of breath, slight dizziness, heart rate after exercise was 186-192 beats / min, but after 1,5-2 minutes. rest, they decreased to 120-126 beats / min. In our opinion, this is the athlete's reaction to natural hypoxia, which is the main sign of mid-mountain conditions.

After adaptation to the conditions of the middle mountains, the athlete's training week consisted of 5 training sessions at the stadium (Ataturk Sport Hall, located at an altitude of 1079 m above sea level), 3 training sessions in the gym, 3 training sessions in the pool, 2 cross-country in the mountains at an altitude of 1200 m and 1 ascent to the mountains at an altitude of 1750 m above sea level.

The athlete noted that after the cross at an altitude of 1200 m above sea level, she felt an influx of energy, which was noted in the ease and speed of running at the stadium. There was an adaptation to mountain conditions, which was reflected in the disappearance of shortness of breath, dizziness; there was more light and brightness in the eyes. The day before the re-testing of the level of preparedness, the group climbed to a height of 1750 m.

At the end of the training camp in mid-mountain conditions, in all the studied indicators, except for the triple jump from a place, statistically significant differences were observed (Table 3).

Table 3

Indicators of the level of preparedness at the end of the study in mid-mountain conditions (n=1)

Indicators	At the beginning of the study			At the end of the study			t	P
	\bar{X}	m	σ	\bar{X}	m	σ		
Standing long jump (m)	2,60	0,02	0,03	2,66	0,02	0,03	17,00	<0,01
Triple Jump (m)	7,31	0,02	0,03	7,35	0,01	0,02	2,08	>0,05
Running 10 m low start on command (s)	1,62	0,02	0,03	1,56	0,02	0,03	19,00	<0,01
Running 30m(s)	4,01	0,03	0,04	3,91	0,02	0,03	17,32	<0,01
Running 100m (s)	12,65	0,04	0,05	12,23	0,05	0,08	6,93	<0,01
Running 150m(s)	19,78	0,02	0,03	19,28	0,13	0,19	4,80	<0,05

The greatest increase was observed in the results in the 10m run from a low start on the team – 3,7% and in the 100m run – 3,3%. The results of the female athlete in standing jumps improved from 2,60±0,03 m to 2,66±0,03 m. In the triple jump from the spot, there were no statistically significant differences between the results at the beginning and end of the training camp (p>0,05). A slight increase in the results in the triple jump from a place is explained by the relatively short time

between testing, as well as spontaneous insurance of the athlete's right foot after an injury on the eve of the training camp in mid-altitude conditions.

Under the influence of loads in mid-mountain conditions, the athlete improved visual acuity (Table 4) of the right eye by 7,9%, the left eye – by 3,07%. The difference between the increase in visual acuity of the right and left eyes, in our opinion, is associated with the peculiarities of congenital damage to the visual analyzer of the studied athlete.

Table 4

Visual acuity indicators at the end of the study in mid-altitude conditions (n=1)

Visual acuity (V)	At the beginning of the study			At the end of the study			t	p
	\bar{X}	m	σ	\bar{X}	M	σ		
Right eye	0,063	0,02	0,03	0,068	0,02	0,033	14,00	<0,01
left eye	0,065	0,001	0,001	0,067	0,004	0,006	0,67	>0,05

After the descent from the mountains, the weekly microcycle was carried out according to the restorative-supporting principle, with a significant decrease in the total volume and intensity of loads. The period of stay in the middle mountains was based on the recommendations of specialists [2, 6, 8, 10] for athletes specializing in speed-strength sports and was equal to two weeks.

To identify the delayed training effect of "mountain training", the female athlete was tested 10 days after the descent from the mountains in the plains (Tables 5-6).

Table 5

Indicators of the level of preparedness after the descent from the mountains (n=1)

Indicators	At the end of the training camp in mid-mountain conditions			10 days after the descent from the mountains			t	P
	\bar{X}	m	σ	\bar{X}	m	σ		
Standing long jump (m)	2,66	0,02	0,03	2,68	0,02	0,03	5,00	<0,01
Triple Jump (m)	7,35	0,01	0,02	7,40	0,04	0,05	1,99	>0,05
Running 10 m low start on command (s)	1,56	0,02	0,03	1,55	0,02	0,03	2,00	>0,05
Running 30m(s)	3,91	0,02	0,03	3,90	0,01	0,02	2,00	>0,05
Running 100m (s)	12,23	0,05	0,08	12,04	0,05	0,07	29,00	<0,01
Running 150m(s)	19,28	0,13	0,19	19,07	0,08	0,12	3,67	>0,05

Table 6

Indicators of visual acuity after descending from the mountains (n=1)

Visual acuity (V)	At the beginning of the study			10 days after the descent from the mountains			t	p
	\bar{X}	m	σ	\bar{X}	M	σ		
Right eye	0,068	0,02	0,033	0,073	0,002	0,003	16,00	<0,01
left eye	0,067	0,004	0,006	0,068	0,002	0,003	1,00	>0,05

The increase in the studied indicators revealed the most delayed training effect from loads in mid-mountain conditions on the results of the female athlete's competitive distance - in the 100-meter run, it improved by 1,6% compared to the previous test.

Indicators of visual acuity of the right eye improved by 7,4%, the left remained almost unchanged.

So, the obtained results testify to the positive effect of training loads in mid-mountain conditions on visual acuity and the level of special preparedness of the studied female athlete.

Conclusions / Discussion

The analysis of scientific and scientific-methodological literature showed that training in mid-altitude conditions is used in most sports, mainly related to the manifestation of endurance, however, no scientific materials on the use of this methodological technique in the training of Paralympic athletes have been found.

As a result of the study, the opinion of M. M. Bulatova on the construction of the training process in mid-mountain conditions was confirmed. It has been established that the rational planning and use of training loads is based on the systematic passage of the stage of initial (acute) adaptation of the studied athlete to the conditions of the middle mountains. The decrease in loads in the first 3 days of the training camp led to the successful passage of the period of acute acclimatization in a visually impaired female athlete.

The information of A. S. Kolchinskaya, V. M. Platonov on the effect of hypoxia on the preparedness of athletes has been expanded and supplemented. It was

found that training under conditions of natural hypoxia improves visual acuity and the level of preparedness of sprinters with visual impairments.

Analysis of the results of a highly qualified sprinter athlete with visual impairments, obtained after applying training loads in mid-altitude conditions, indicates that the results in long jumps from a place, 10-meter running from a low start on command, 30-meter, 100-meter and 150-meter runs reliably changed. Significant changes were observed only in visual acuity of the right eye. Thus, the use in training of a highly qualified sprinter with visual impairments of training in mid-altitude conditions had a positive effect on the level of special preparedness and visual acuity indicators.

A reliable increase in results at the competitive distance after a ten-day stay in the conditions of the plain allows us to say that such loads can be used in the competitive period at the stage of direct preparation for the main competitions.

Prospects for further research. The research materials will allow to analyze the training of highly qualified sprinters with visual impairments, taking into account the organization of their annual training.

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